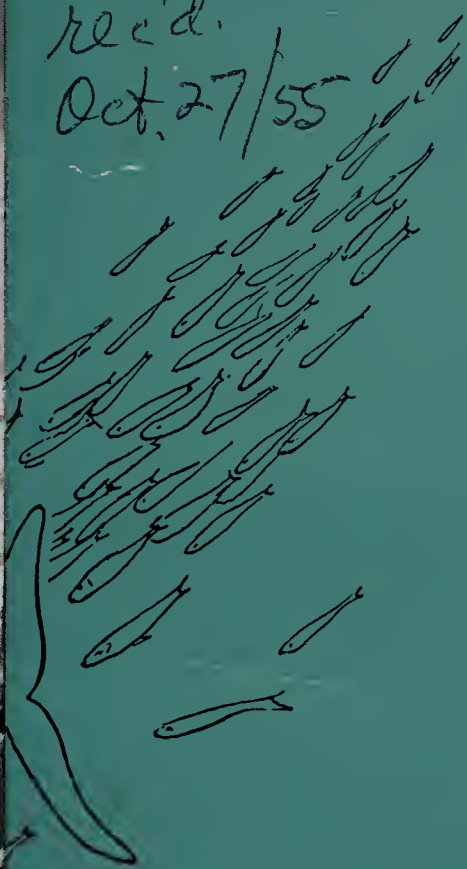


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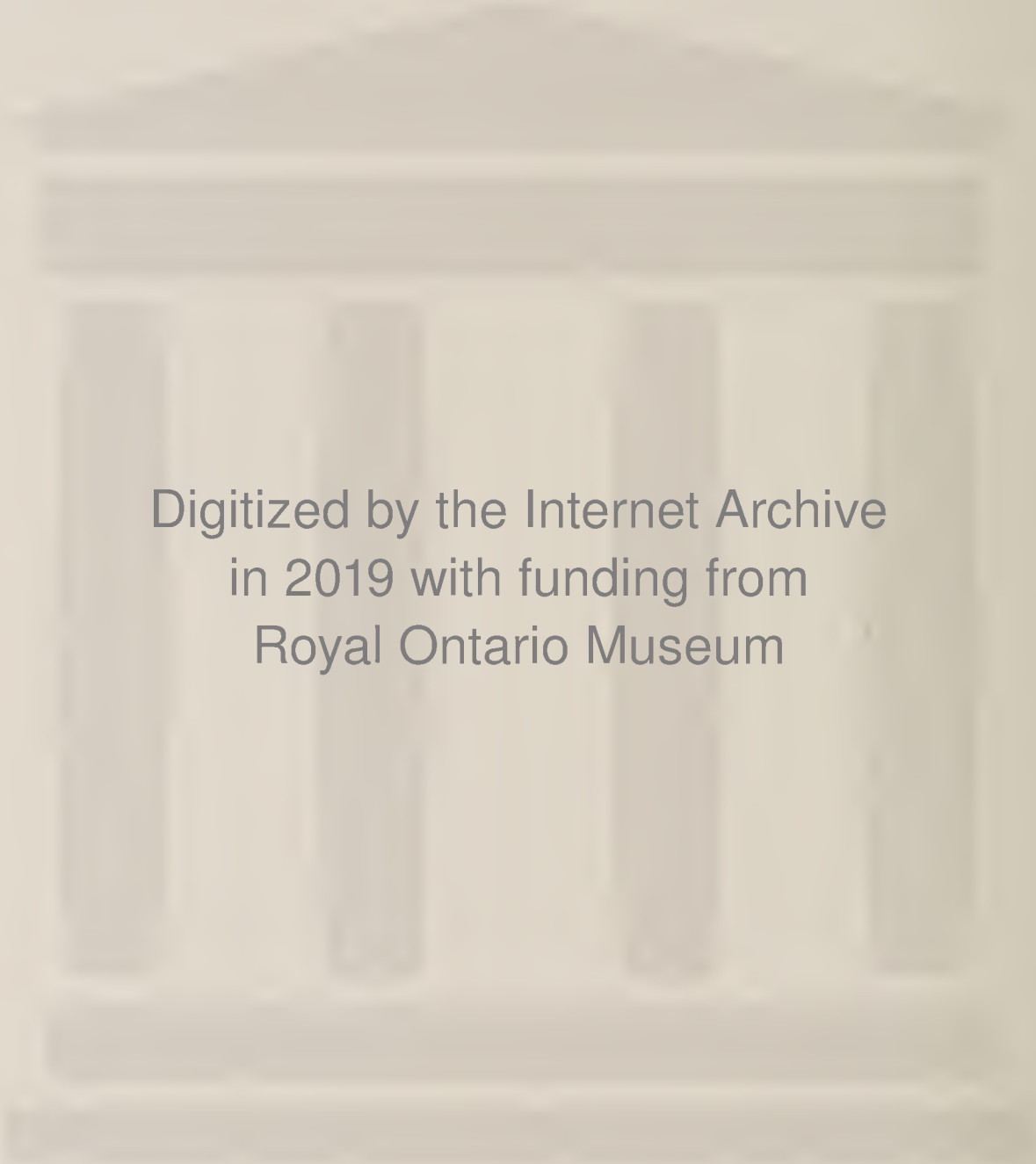
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ROYAL ONTARIO MUSEUM OF
ZOOLOGY & PALAEOONTOLOGY

Report of the Director

1955



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ROYAL ONTARIO MUSEUM OF ZOOLOGY & PALAEONTOLOGY

ROYAL ONTARIO MUSEUM OF ZOOLOGY & PALAEONTOLOGY

Report of the Director

For the year ended June 1955

PRINTED BY THE UNIVERSITY OF TORONTO PRESS : 1955

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F. A. Urquhart, M.A., PH.D., *Director*
M. A. Fritz, PH.D., F.R.S.C., *Associate Director*
L. L. Snyder, *Associate Director*
M. Easto, *Secretary*
E. N. Hammell, *Librarian (Palaeontology)*
E. R. McClure, *Librarian (Zoology)*
R. R. Hornell, *Chief Technician (Palaeontology)*
E. H. Taylor, *Chief Technician (Zoology)*
G. Pyzer, *Attendant and Storekeeper*

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G. Edmund, M.A., *Assistant Curator*

DIVISION OF MAMMALOGY

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S. C. Downing, B.A., *Research Assistant*

DIVISION OF ORNITHOLOGY

L. L. Snyder, *Curator*
J. L. Baillie, *Research Assistant*

DIVISION OF ICHTHYOLOGY AND HERPETOLOGY

W. B. Scott, PH.D., *Curator*
E. B. S. Logier, *Associate Curator*

DIVISION OF INVERTEBRATE PALAEONTOLOGY

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DIVISION OF ENTOMOLOGY

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E. M. Walker, M.B., F.R.S.C., *Honorary Curator*

DIVISION OF ART AND EXHIBITS

T. M. Shortt, *Chief*

A. Reid, *Artist*

SUMMARY REMARKS BY THE DIRECTOR

Since our Annual Report has now taken on the dignity of an authentic publication, the members of the Curatorial Staff are of the opinion that a feature article should be included in each report. The feature article in this report, "Steps in Making Durable Lightweight Casts of Latex" was written by Mr. A. Reid, artist in the Division of Art and Exhibits. That Mr. Reid is highly qualified to discuss this particular phase of our work is evidenced by the fact that he received the Canadian Plastics Achievement Award of Merit in Science and Medicine.

In the report for last year mention was made of a proposed expedition to the Red Deer River region of Alberta to investigate recent exposures of dinosaurs. I am pleased to report that the expedition was most successful. In addition to finding a number of disarticulated specimens, which are of considerable importance in the field of research, the following discoveries are worthy of special mention: a complete crocodile skull which is new to our collection and, perhaps, represents a species new to science; skulls of four different species of duckbilled dinosaurs, of which two are believed to represent species hitherto undescribed in the literature; a mammal jaw of extreme rarity in this particular formation, representing a new species. The Museum is most grateful for the financial assistance so generously given to us by the Carling Conservation Club which made this important expedition possible.

Mr. Gordon Edmund, Assistant Curator of Vertebrate Palaeontology, is now preparing a manuscript dealing with his research on tooth replacement in dinosaurs, which will be published during the next University year.

Dr. R. L. Peterson's book, *North American Moose*, was published by the University of Toronto Press. This marks the completion of an excellent phase of research dealing with one of North America's most important and well known species of game mammals. At a special tea held in Dr. Peterson's honour, an author's copy of this book was presented to him by Mr. C. O. Dalton, President of Carling Breweries Limited.

Mr. L. L. Snyder, having completed his manuscript on Arctic birds, which will appear in published form during the coming University year, has now turned his attention to a comprehensive work provisionally titled "The

Ontario Ornithologists' Handbook," which is the result of his thirty-eight years' study of the bird life of our province.

Mr. E. B. S. Logier completed his book-sized manuscript, "A Check-list of the Amphibians and Reptiles of Canada and Alaska," which is to be published during the next University year.

In cooperation with the Department of Lands and Forests, a chart illustrating the sport fishes of Ontario, was produced by the University of Toronto Press. The coloured illustrations were the work of Mr. E. B. S. Logier.

Dr. W. B. Scott, having completed his book on the freshwater fishes of eastern Canada, turned his attention to a study of the freshwater fishes of western Canada and, during the summer months, conducted a faunal survey of Manitoba, Saskatchewan, Alberta, and British Columbia.

Dr. M. A. Fritz, in addition to carrying out a study of the brachiopod genus, *Leiorhynchus*, in collaboration with Mr. Lemon, continued her studies of the Nipissing-Mattawa collection.

Dr. E. M. Walker continued the preparation of a manuscript dealing with the Odonata of Canada and Alaska. His attention has been confined to a study of the Anisoptera, and the manuscript dealing with the families Gomphidae, Petaluridae, and Cordulegastridae was completed, while that on the Aeschnidae was well advanced.

The major project of the Division of Art and Exhibits, A Gallery of Canadian Fishes, was completed during the past year. We were indeed honoured to have Mr. James Sinclair, P.C., M.P., Minister of Fisheries for Canada, officially open this display, and to have Dr. Sydney Smith, President of the University of Toronto, introduce the subject and speaker to the many guests who attended. I would call your attention particularly to the report of the Chief of the Division of Art and Exhibits for a comprehensive description of this new gallery.

In this report I should like to discuss briefly our publication fund. Six years ago the total amount on deposit in our publication fund was five hundred dollars. With the necessity of publishing the scientific findings of the Museum and a tentative list of thirteen book-sized popular publications awaiting publication, this amount was obviously far from sufficient. The average cost per unit of these publications was estimated at three thousand dollars, making an anticipated expenditure of over forty thousand dollars. At a meeting of the Curators' Committee it was agreed that a decided effort would be made to increase the publication fund, so as to cover the cost of all future requirements and to make available to others our present knowledge of the animal life of our province. A system was devised whereby the amount

invested in any one saleable volume would be returned to the fund and thus offset the cost of freely distributed scientific papers. The Curators agreed to forego any large-scale expeditions and to curtail increases in the present study collections—the latter, it was agreed, should be completely arranged and catalogued before adding further specimens. As a result of such arrangements it has been possible to publish a number of important books dealing with various phases of the animal life of Ontario. Also, our Museum has been able to produce scientific publications under its own name, rather than drawing on reprints from journals, as was necessary in the past.

Research dealing with the systematics and distribution of the animal life of our country is most important, and when such research has been completed, it is equally important that this knowledge be made available to other workers and to the lay public. It is our sincere desire that this phase of our work will progress toward a sound and established practice, so that the knowledge of the Canadian fauna which we accumulate will be available to all now and in the future.

The presentation of scientific investigations in published form represents years of study, years of accumulating specimens and scientific data, as well as the combined efforts of many individual members of our staff. I would emphasize the importance of the work of the technicians in preparing the specimens for study, of the research assistants in keeping the records and collections of the scientific division up to date, of the librarians in making literature readily available, of the secretary in handling accounts, office supplies, typing of manuscripts and many other duties, and of the attendant in making the necessary repairs to divisional equipment, keeping camp equipment in good repair, and attending to many and varied tasks. Indeed a publication is the result of team work in which, although all members do not receive special mention, all may derive pleasure in having taken part in a final product that is well conceived, well presented, and, we trust, well received.

STEPS IN MAKING DURABLE LIGHTWEIGHT CASTS OF LATEX

By A. REID

The process described below pertains to the making of a complete fish cast in latex by means of a two-piece mould. Experienced workers in the field of museum reproduction will recognize the similarity of some of these steps to those of the old method. It is hoped, however, that due appreciation will be felt for the simplicity of the process and the advantages of latex casts over plaster and wax casts. For interested, non-experienced workers the process is described in detail.

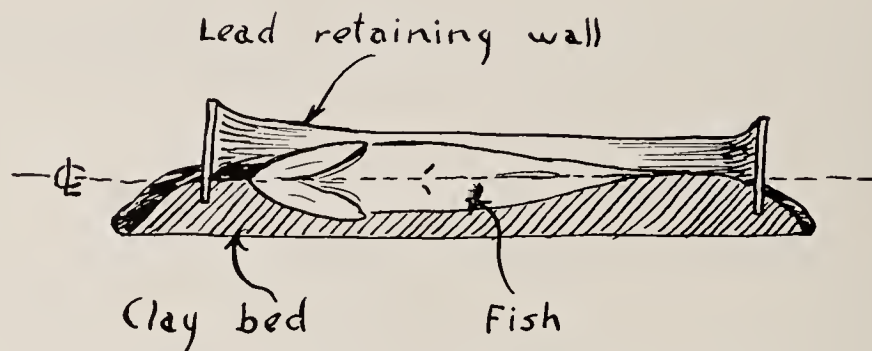
PREPARING THE SPECIMEN AND CLAY BED

The fish is prepared by first removing the pectoral and pelvic fins from the body at their junctions. The fins are then immersed in water to prevent shrivelling and are cast separately in latex or cellulose. The body of the fish is washed (sometimes scrubbed) with soap and cold water to completely remove the protective covering of slime, so that the fine detail of the scales will register on the surface of the plaster mould. It is then rinsed and immersed in an alum bath (1 large teaspoonful of powdered alum dissolved in a pint of cold water).

While the fish is in the alum bath, a clay bed is prepared. A mound of well-worked clay is pounded out to an area one inch greater than the outline of the fish and of sufficient thickness so that an excavation may be made deep enough to accommodate half the thickness of the fish. The specimen is removed from the bath and placed on its side on the surface of the clay. The outline is marked in the clay, the fish removed, and the clay dug out from within the outline in the approximate contour of the fish.

When the specimen is replaced in the excavation it should lie to its median line, exposing one side entirely. The surrounding clay should be adjusted to fit the outline snugly in order to avoid undercuts. The exposed casting surface of the fish should be washed frequently with water to prevent drying. The required casting area is surrounded with a clay wall or strips of sheet lead, which make excellent easily formed walls, to retain the plaster

when it is poured and prevent it from spreading unnecessarily. Before pouring plaster, the exposed portion of the fish is washed thoroughly with alum water.



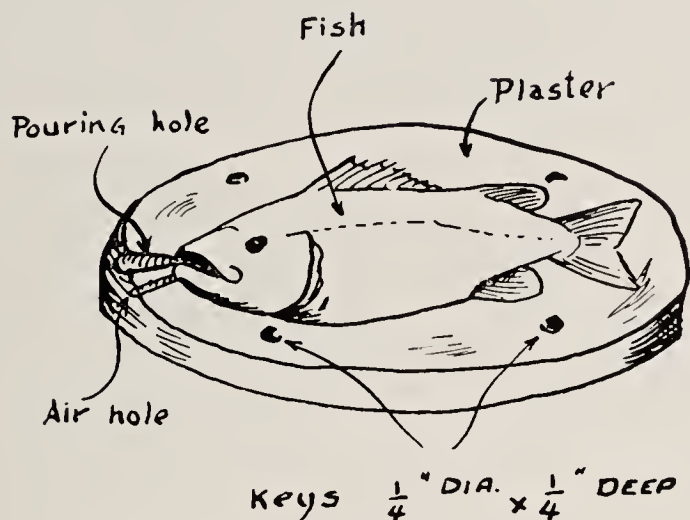
MAKING THE MOULD

To mix the plaster, the estimated amount of water required is poured into a bowl, and the plaster sifted into it until no open water shows on the surface. Allow to stand for a few minutes before stirring. Care should be exercised not to beat air bubbles into the mixture. The mix is vibrated in order to bring any air bubbles present to the surface to be broken. The plaster is poured gently over the fish, beginning at the head and continuing towards the tail, until a layer of approximately one-quarter of an inch has been built up above the highest point of the fish.

When the plaster has set the retaining walls are removed, and the entire unit, including the plaster mould, fish, and clay bed, is turned over, clay bottom up. The clay bed is removed, leaving the fish half embedded in the plaster mould. It may be necessary to trim the plaster around the fins in order to completely expose the other half of the fish for casting. Keys (smooth hemispherical depressions) are cut in the face of the first plaster piece, so that the two halves, when completed, may be perfectly aligned. Clay water is most satisfactory in preventing the two halves from fusing together, and is applied to the face of the first piece prior to pouring the second. The second part of this two-piece mould is produced by repeating the stages used for making the first piece.

When the second pouring is set, the two-piece mould containing the specimen is immersed in water and pried open along the seam with a wedge-like instrument. The mould opened, the fish is removed, and a pouring hole is carved in the mould in a convenient location. Through this hole the latex casting material is poured when the mould is assembled. In most cases a separate air hole is an advantage, as will be mentioned later. The most

satisfactory casts are made the day following that in which the mould is made, while the mould is still moist.



CASTING MATERIAL

The casting material consists of one part by weight of natural latex (the viscosity approximating that of cream) to three parts mineral filler. These components, along with detailed instructions, are available through General Latex and Chemicals (Canada) Ltd., Verdun, Montreal, Quebec, Canada.

The latex called CA-132(a) should be thoroughly mixed with the filler CA-132(b) and allowed to stand twelve to twenty-four hours to rid the mix of air bubbles. It should be noted here that increasing the proportion of part (a) results in a more rubbery casting, and increasing the proportion of part (b) produces a heavier, less durable casting.

MAKING THE CAST

The mould is made ready for casting by assembling and binding the two pieces tightly together with wire or cord. It is then supported in such a position that the pouring hole is at the most elevated point. A ring of clay is placed around the pouring hole forming a small reservoir for the casting compound. The air hole should be just outside this ring. As the mix is poured into the mould, air in the mould cavity is expelled through the air hole. When the cavity is filled, the air hole is sealed with a cap of water clay. As the moisture in the casting material is absorbed into the plaster mould, the level of the casting material drops. It is therefore necessary to keep the mould filled to the top of the reservoir with the casting compound until the desired build-up is attained on the face of the mould.

The principle on which this material works is similar to that of clay in the casting of pottery wares. The moisture in the casting material is absorbed into the plaster mould, drawing with it fine particles of the latex compound which are deposited upon the surface of the mould, thus giving perfect registration. These particles build up on each other, and in 30 minutes form a skin about $1/32$ to $1/16$ of an inch thick, which is of sufficient thickness for most castings. At this point the mould is turned upside down and the centre portion of the compound, which is still in a liquid state, is poured out and stored for later re-use. Before pouring off the liquid compound, uncap the air hole and clear it of semi-set material. This allows a freer flow and thorough draining. The mould should be left inverted overnight to drain thoroughly. The mould will part easily with a little leverage along the seam, leaving the cast in one half of the mould. It will be noted that the exposed surface is quite rubbery, and is easily deformed with handling. If this occurs, the normal shape can be restored by blowing into the hollow cast through the pouring hole with one's own breath or gently with compressed air. The exposed surface of the cast is allowed to dry for about four hours, in which time it should have hardened sufficiently to allow the other half of the mould to be removed. The cast is then suspended by a string tied around the pouring "nipple" for twenty-four hours to complete drying.

FINISHING THE CAST

When the cast has been completely removed from the mould (before the 24-hour drying period), it is in a state in which it may be manipulated slightly. Thus you can change the sweep of the tail to any desired degree or put wave action into a caudal or anal fin. This makes it possible to make many casts from one mould, and, by varying the attitudes of fins and tails (and to a lesser degree, the body), to display them as a school of fish simulating varied action.

After the drying period, the cast is trimmed with scissors or a sharp knife and finally sanded if necessary. The application of a thin coat of white shellac is recommended prior to painting with oil colours in order to protect the latex from the detrimental effects of the turpentine in the paint. An undercoating of pearl essence thinned with amyl acetate is then sprayed over the surface of the cast, which produces a fish-like quality not obtainable by any other means. The hand painting of casts with oil colours should, of course, be guided by the use of field or colour sketches and, if possible, coloured transparencies projected in a table viewer.

MOUNTING

Two bolts, by which the finished cast is mounted on a plaque, may be situated on the back of the cast. A small 1" by 2" section is cut out and on each side of this a hole is drilled. The bolts, including a large washer on each, are inserted through the holes from the inside through the opening.

FINS

When only one cast of a fish is required, the original fins may be pinned in position on a card until dry, and after painting, glued to the cast. However, if more than one cast is required, moulds must be used.

Although there are numerous materials and methods suitable for making the fins, the following method is suggested as a quick and satisfactory process. A mould is made of one side of each fin. When the plaster has set, the fin is removed and the mould set aside to dry thoroughly. Cut from a sheet of cellulose acetate a piece slightly larger than the fin. Heat the dried mould in an oven to the temperature at which the celluloid softens. Place the piece of celluloid on the mould face until it becomes pliable, then, using a soft cloth, swiftly rub and press the celluloid into the detail on the mould. Each fin may be produced in the same way, trimmed with scissors, painted, and glued to the cast.

OTHER USES OF LATEX FOR CASTING

This casting material has been used also in the casting of snakes and lizards, and for making manikins for mammal mounts. For snake casts a three-quarter waste mould is quite satisfactory. In this case the CA-132(a) is used excluding any part (b) filler. The latex (CA-132a) is painted directly upon the mould surface. When this becomes tacky, a second coat is applied followed by a third which is reinforced with strips of preshrunk flannel or cotton saturated with latex. Continuous layers may be laid up until desired reinforcement is reached.

It is possible to transfer the colour patterns from the original specimen to the mould and finally to the latex cast by using the paint from colorizer tubes for tinting rubber base paints. The colours are painted onto the specimen, and when the plaster mould is made the pigments are drawn onto the surface of the mould. The colour patterns on the mould are repainted, and when the latex cast is formed the pigments are drawn onto the latex, leaving the colour pattern on the cast. With all or most of the pattern accurately plotted it is a simple job to shellac and touch up the finished cast.

It is hoped that these basic techniques will be of use to members of other museums and adapted to their own particular problems.

DIVISION OF VERTEBRATE PALAEOONTOLOGY

By L. STERNBERG

The results of the expedition to the dinosaur beds of the Red Deer River of Alberta were very satisfactory in spite of the rain, which was the heaviest that southern Alberta has experienced in more than fifty years. Our finds included an exceptionally fine crocodile skull, new to our collection; the skulls of four different species of duckbilled dinosaurs, one of which had part of the skeleton and a considerable amount of skin impression present; one very small (incomplete) mammal jaw, which is only the second such jaw ever found by parties from this Museum; four very good turtles; and a number of separate dinosaur jaws. It is believed that four of the specimens



Dinosaur exposure being made by Museum staff

—the crocodile skull, two of the duckbilled dinosaur skulls, and the small mammal jaw—may represent new species. The jaws will be of value to the Assistant Curator in his study of the replacement of reptile teeth. Cooperation was given to Mr. M. Ross of Calgary who took a thousand feet of 16-mm. film of the badlands, showing the prospecting, collecting, and packing of some of our finds. We were able to procure a copy of this film which will eventually be incorporated into a one-hour movie showing the field work of each division in the Museum.

Reproductions of six of our dinosaur skulls were made and sent to three United States museums. Two of these skull casts, along with four fossil turtles, were sent to the Los Angeles Museum, completing an exchange agreement of long standing. Two skull casts were sold to the University of Nebraska Museum, making a total of four such casts sent to that museum. The hind leg and foot of a Hadrosaurian dinosaur, two skull casts, a number of smaller casts, and some original fossil material were sent to the Cleveland Museum of Natural History in exchange for a cast of the head and shoulder plates of the giant Devonian fish, *Dinichthys*. This cast will make an impressive addition to our gallery display of fossil fish. Photographs of nine of our dinosaurs were loaned to Oklahoma City for a display on the age of dinosaurs in their annual exhibition.

An open exchange agreement was made with the National Museum of Canada in 1949, at which time we received an unprepared skull and partial skeleton of an armoured dinosaur from them. We agreed to send them the partial skeleton of a horned dinosaur collected by us in 1935, which skeleton was delivered to them in May of this year.

The Assistant Curator gave a lecture course on Vertebrate Palaeontology to a class in third year Geological Sciences, University of Toronto. His work toward the completion of his thesis for his Ph.D. has taken him to six of the larger museums in middle and eastern United States during the year. He was able to borrow a considerable amount of duplicate material for study, and a great many type specimens of early reptiles were examined at the various museums he visited. An X-ray camera was purchased which will aid greatly in his studies on the replacement of reptile teeth. Numerous X-ray photographs of the jaws of fish, amphibians, and reptiles have been taken with excellent results.

The Associate Curator made the six casts of the dinosaur skulls that were exchanged or sold to three United States museums. He has spent a great deal of time in the preparation of the fossil fish collection brought back from Quebec in 1952. Progress on this task is very slow owing to the need for minute and painstaking work with the binocular microscope.

Further improvement has been made by the Associate Curator to the divisional library by the addition of more than three hundred articles on Vertebrate Palaeontology, which were obtained by exchange, donation, and purchase. Index cards were made for these publications and were added to our reference catalogue.

A considerable amount of information was supplied in reply to enquiries from the general public and from several writers. Among the writers assisted are Mr. Fred Bodsworth of Maclean's Magazine who is writing a lengthy article on the life of the past of Alberta and Saskatchewan for their semi-centennial celebration; Mr. Miller Stewart, a writer of radio programs on natural history for the Canadian Broadcasting Corporation; and the editor of a magazine published by the Canadian Bank of Commerce who has made numerous enquiries in connection with a popular article on dinosaurs that he is writing.

Mr. James Woodford was employed on a part-time basis by the Division. His duties have been the binding of lantern slides, indexing separates, the cataloguing of twenty-five fossil vertebrates, and being of general assistance to the Division.

DIVISION OF MAMMALOLOGY

By R. L. PETERSON

Two events of especial importance highlighted the activities of the Division during the past year. On March 7, 1955, *North American Moose* by the Curator was published by the Museum in cooperation with the University of Toronto Press. During the summer of 1954 a live colony of the rare rodent genus *Phenacomys* was established from animals taken near Churchill, Manitoba, by Mr. J. Bristol Foster. Females, captured when pregnant, have given birth to young which have been successfully reared, but as yet our colony has not been induced to breed in captivity. Various techniques are being tested which may provide suitable conditions for breeding.



Mr. C. O. Dalton presents author's copy of *North American Moose* to the Curator

Although no organized field work was undertaken by the Division this past year, a total of 757 specimens was received. These were almost exclusively donations by individuals. Mr. J. Bristol Foster, University of Toronto student, donated 111 small mammals from the Churchill region of Manitoba which included over 50 *Phenacomys*. Mr. D. S. Smith, graduate student of the University of Toronto, presented us with 198 laboratory-reared lemmings (*Dicrostonyx*) of known age. Mr. E. H. McEwen, of the Canadian Wildlife Service, provided 50 specimens from the Northwest Territories which included 8 specimens of the orange-cheeked vole (*Microtus xanthognathus*). Mr. D. H. Pimlott of the Newfoundland Department of Mines and Resources presented 19 specimens of large mammals from Newfoundland. Through the courtesy of Dr. E. R. Bowness, of Toronto Elevators Limited, 73 skulls of known-age, ranch-raised red fox were made available from the Master Feeds Demonstration Fur Farm. These will be of particular value in our studies of variation of the genus *Vulpes*. Other collections received include 32 small mammals from Nova Scotia from Mr. W. L. Klawe, 35 *Clethrionomys* skulls from Thunder Bay District, Ontario, from Mr. D. Bates, as well as specimens received through the facilities of the Ontario Department of Lands and Forests which included a particularly fine wolverine from the Patricia portion of Kenora District, Ontario.

A total of 934 specimens was prepared in the laboratory and 1,690 specimens were catalogued and placed in our collections during the past year. During the summer months a student-assistant preparator provided assistance in the preparation of specimens, and curatorial work with the collection was aided by the services of Mr. C. S. Churcher, graduate assistant.

The research program of the Curator was concentrated on final editing and proof-reading of the manuscript and page proofs of *North American Moose*. One additional paper was published (a review of *Die Wildkatsen der Alten Welt. Eine Ubersicht uber die Untergattung Felis* by Th. Haltinorth), another, on the occurrence of *Phenacomys* in speckled trout stomachs, was accepted for publication in the *Journal of Mammalogy*, and a manuscript was almost completed, in cooperation with Mr. S. C. Downing, Research Assistant, on the distribution and status of the opossum in Canada. Research was carried forward on the genus *Vulpes* with Mr. C. S. Churcher taking over most of the project as a subject for a Ph.D. thesis under the direction of the Curator. Work continued on the genus *Phenacomys*, with Mr. J. Bristol Foster assisting with the live colony which he secured during the past summer. He plans to carry out additional studies in the field this coming summer, a part of the results of which is to be used as the subject

NORTH AMERICAN MOOSE

BY

RANDOLPH L. PETERSON

CURATOR, DIVISION OF MAMMALOGY, ROYAL ONTARIO MUSEUM
OF ZOOLOGY AND PALAEONTOLOGY

UNIVERSITY OF TORONTO PRESS : 1955

IN CO-OPERATION WITH THE

ROYAL ONTARIO MUSEUM OF ZOOLOGY AND PALAEONTOLOGY





NORTH AMERICAN MOOSE

By RANDOLPH L. PETERSON

OUT OF SIBERIA, across the narrow Bering Strait, from Alaska down into central North America, following ever widening pockets in the glaciers, came North America's largest big-game mammal—the moose.

Today the province of Ontario harbours the most bountiful herd on the continent, approximately 42,000. The majestic moose is as much a Canadian heritage as the dark spruce forests of the north. The native Indians lived on his flesh and wore his skin on their backs; explorers returned home to spread extravagant legends about the great "Monster of superfluity"; sportsmen still praise him above all other beasts of the chase.

Dr. Peterson has assembled everything currently known about the moose and, to aid in the prevention of the possible extinction of this valuable animal, has produced the facts necessary for a sound management programme for its continued conservation. The present work is the combination of an exhaustive search of existing literature together with the results of personal studies carried out in the field and in the laboratory. It will become an indispensable text for everyone from zoology professors to big-game hunters, and will be of special value to wildlife administrators. Its avoidance of technical jargon will recommend it to all.

R. L. PETERSON is Curator of the Mammalogy Division, Royal Ontario Museum of Zoology and Palaeontology.

xii + 280 pages. Line-drawings, photographs and charts. \$12.50 T

In general the observations carried out in this work indicate that the ears often serve to alert the animal, the eyes to investigate, while the final stimulus, causing immediate reaction, is transmitted by smell. When approaching an animal upwind silently in a canoe we were usually successful in getting within close range. Even when the animal detected our presence, rarely did it rush away without stopping and turning to look at us for a second or third time. When travelling noisily upwind through the bush we were occasionally surprised by a moose a few yards ahead watching our every move. Frequently if we stopped and stood silent the moose would continue to watch us, perhaps move a few steps and turn to look again before finally moving away.

We found it exceedingly difficult to move into close range of moose from downwind. Even when animals were observed across a lake as far away as one-half mile, a silent downwind approach usually caused them to become alert or move away before we got within much less than one-quarter of a mile.

When moose were observed as they travelled through the bush, unaware of the presence of humans, they commonly stopped periodically and turned their head and directed their ears in the direction from whence they had come as if they suspected they were being followed.

While observing from our tower at the salt lick we could frequently predict the approach of a second moose by watching the activity of a moose in the lick. It could apparently detect the approach of another animal long before we could see or hear anything unusual.

Apparently the fear of human odour is not as highly developed in yearlings as in adults. On several occasions yearlings would approach quite close to us, even upwind, when we were sitting quiet and unhidden near a trail. After finally becoming frightened and trotting away they frequently returned again in a short time.

One remarkable accomplishment noted in moose was their ability to locate submerged vegetation. Perhaps the sense of touch is involved. On numerous occasions moose were observed to swim out to deep water, then suddenly dive for a few seconds, perhaps become completely submerged, and come up with a mouthful of pond weed (*Potamogeton* sp.). No portion of the plant would be visible from the surface, yet the moose seemed to know where to find it. It is difficult to understand what senses are involved, unless the animal actually touches the plants with its legs.

DISPOSITION, TEMPERAMENT, AND MANNERISMS

The degree of alertness of individuals seems to govern their general behaviour. An alerted or suspicious animal can move through dense bush with

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of a Master's degree. The Research Assistant completed a preliminary survey of our *Peromyscus* collection, and completely reorganized some 3,300 skins and skulls. He is also collaborating with the Curator on a systematic program of detailed differentiation of the distribution, with range maps, of the mammals occurring in eastern Canada.

The Curator again conducted the mammal portion of the undergraduate course (Zoology 25), University of Toronto. He served as editorial referee for several papers submitted for publication in the *Canadian Journal of Zoology*. He attended the regular annual meeting of the American Society of Mammalogists, where he was again re-elected as Recording Secretary of that organization. He also attended the North American Wildlife Conference held at Montreal, Quebec, where he served as discussion leader of the Technical Session on Big Game.

DIVISION OF ORNITHOLOGY

By L. L. SNYDER

The total of 220 specimens added to the collection during the year included the donation of 52 skins of Alberta birds from Mr. O. D. Boggs; 28 skins from Aklavik presented by Mr. C. H. McEwen; the first Ontario specimen of Ross's Goose from Mr. Paul Holmes, R.C.M.P.; the only extant Ontario specimen of the Kittiwake, received from the Ontario Department of Lands and Forests; and the first material evidence of the nesting of the Black-backed Gull for the Great Lakes from Mr. Howard Krug. An exchange was made with Mr. H. G. Lumsden of the Department of Lands and Forests, the Museum acquiring, among other items, an interesting series of grouse hybrids. A few specimens from England were secured through an exchange with Mr. W. H. Barrow of Leicestershire. Specimens prepared in the Museum laboratory during the year totalled 75. This new material was catalogued and distributed in the collection, and the backlog of uncatalogued specimens received some attention. Total catalogued, 682.

The Museum's function of research with its many ramifications has occupied a considerable portion of the attention of the Division's staff during the year. The Curator has completed the manuscript of a book, "Arctic Birds of Canada," which is designed primarily as a field guide, but which will be useful as a reference for ornithologists generally. He has also drafted an outline of a comprehensive work provisionally thought of as "The Ontario Ornithologists' Handbook." This work is a long-term project involving critical study of the collection and extensive search into ornithological literature. It will utilize the distribution maps being progressively developed by the Division. The Research Assistant, with part-time assistance, has advanced our mapping very appreciably during the year. Ontario's north-south span approximates 1,000 miles, and it follows that many animal forms reach their range limits in our province. The factual data accumulated by this Museum's surveys and its compilation of literature and selected manuscripts have produced a mass of information which makes possible the drafting of bird ranges in Ontario in far greater detail than for any other faunal element.

The Curator's annual census and bird banding activities in King Town-

ship were continued during the early summer. The Research Assistant has continued his compilation of reports for the Ontario-Western New York region for the Audubon Seasonal Reports. He also prepared an inventory of water bird egg specimens available for study in this Museum for the editor of the proposed Handbook of North American Birds.

Assistance by the Division to the researches of others has included the supplying of a Canadian avifauna bibliography to Dr. O. S. Pettingill, Carleton College; information on jaeger plumages to the Bureau of Animal Populations, Oxford, England; distributional records to a graduate student at the University of Michigan; and location of Ontario place-names for the Carnegie Museum. Also, specimen material has been loaned to the Canadian National Museum (11); the Carnegie Museum (109); the U.S. Fish and Wildlife Service (46); the U.S. National Museum (14); the University of Oklahoma (5). Identifications have been made for the University of Washington and the Customs and Excise Division of the Department of National Revenue. Two ornithologists, Mr. Theed Pearse of Comox, B.C. and Mr. Peter Landry of Cobourg, Ontario, have used the facilities of the bird collection for particular studies.

The Curator gave the ornithological portion of the undergraduate course (Zoology 25), University of Toronto, as usual and gave four talks to groups other than University classes. As a non-museum, but related, activity, a series of lectures was given by the Research Assistant as an introduction to local bird study for the Department of University Extension. In addition, he gave ten talks during the year to other groups, or on television.

Support of local and international organizations has been the obligation and privilege of the staff as usual. The Curator attended the Seventy-second Stated Meeting of the American Ornithologists' Union at the University of Wisconsin, taking part in the business sessions of the organization. In addition to attention given to correspondence of a special professional nature, the staff has kept abreast of a considerable volume of inquiry from the general public.

DIVISION OF ICHTHYOLOGY AND HERPETOLOGY

By W. B. SCOTT

The normal activities of divisional work were resumed during the past year following the reorganization of the research collection, which included the replacement of the wooden storage cupboards by steel shelving. The Division was particularly fortunate in having the very able part-time assistance of Mr. James Woodford, student, during the period. Mr. Woodford acted as laboratory assistant and cataloguer.

Although the Curator's time was largely taken up with gallery work and teaching duties, the routine work of the Division was carried on at a very satisfactory rate. The research collection was increased in size and usefulness by the addition of many valuable collections. These additions have decidedly enriched our knowledge of the Canadian fish fauna, particularly that of Ontario. Many of these collections have extended the known distribution of species, and one collection included a species new to the Ontario fauna. Some 975 lots, containing over 4,000 specimens, were added to the permanent research collection, while 645 lots (approximately 6,000 specimens) were accessioned. Probably the most important collection was one of 2,400 specimens from the Lake Superior drainage obtained through the cooperation of the Canadian Department of Fisheries and the Ontario Department of Lands and Forests. At the invitation of the Department of Fisheries and in conjunction with the sea lamprey control program, the Curator spent over two weeks collecting in the eastern Lake Superior region. The excellent collection obtained was made possible only by the cooperation and assistance of the field staff of this project. Other valuable and noteworthy accessions include a collection of 350 lots of fishes from Peel, York, and Ontario counties, Ontario, donated by the Ontario Department of Planning and Development; a collection of 19 lots of Newfoundland fishes, principally salmonids, collected by Dr. Frank Rigler while he was in the field with an expedition from the Royal Ontario Museum of Geology and Mineralogy; and smaller collections from various parts of Ontario, Manitoba, and Saskatchewan.

Although no specimens of amphibians and reptiles were added to the permanent research collection, 43 lots and individuals were accessioned.

In response to the requests of various institutions and government departments approximately 3,300 fish specimens were identified. Among the organizations requesting this service were Canadian Department of Fisheries, Fisheries Research Board of Canada, Canadian Wildlife Service, Ontario Department of Lands and Forests, Ontario Department of Planning and Development, and Department of Natural Resources and Industrial Development.

The research collection has been of service to ichthyologists of other institutions also. Dr. V. D. Vladykov, Department of Maritime Fisheries, Quebec, made use of the collection during a two-day visit. In addition, fish specimens have been loaned to or exchanged with other institutions such as the United States National Museum, Cornell University, University of British Columbia, University of Saskatchewan, and the Fisheries Research Board of Canada. Collections of amphibians and reptiles have been loaned, on request, to Colgate University, Chicago Natural History Museum, University of Georgia, and South Western Biological Supply Company.

Laboratory facilities were made available to Mr. G. H. Lawler, Fisheries Research Board of Canada, for a five-month period while he continued his research on whitefish populations.

Curatorial activities other than routine divisional administration and research were varied. The Curator conducted a graduate course in ichthyology from October to April at the University of Toronto, and also served on graduate committees. The Associate Curator has completed a check-list of amphibians and reptiles of Canada and Alaska with distributional maps. This valuable piece of work is now ready for publication. The following meetings were attended: Canadian Committee for Freshwater Fishery Research, Ottawa; the Lake Erie Management Committee, Niagara Falls; the Ontario Council of Commercial Fisheries, a portion of which meeting was held in the theatre of the Royal Ontario Museum. The Curator was also appointed a member of the Campaign and Building Fund Committee of the Canadian Aquaria Society for the proposed Toronto Public Aquarium. Several meetings were attended in connection with this project. Other activities of the Curators included technical assistance to the Division of Art and Exhibits during the preparation of the Gallery of Canadian Fishes which was opened this year, and participation in three radio programs and two television programs devoted to fishing and outdoor activities.

The Curator was elected to the Board of Governors of the American Society of Ichthyologists and Herpetologists, term of office to begin January 1, 1955.

DIVISION OF INVERTEBRATE PALAEOONTOLOGY

By M. A. FRITZ

During the year under review valuable study and exhibition materials were added to our collection, of which 272 specimens were obtained by staff collection, 48 by donation, and 70 by exchange. Attention is drawn to the following acquisitions.

A great many valuable specimens were collected on a trip to Lake Nipissing and to an area near Mattawa in June, 1954. This trip was made possible through a grant from the Advisory Council of Scientific Research at the University of Toronto. These two regions are of importance in that the Palaeozoic rocks preserved lie entirely within the Precambrian Shield. Hence they represent isolated outliers of strata that were once of much greater extent. It follows that the fossils collected on this trip are of considerable value.

Among the more significant donations a suite of corals and brachiopods from the Sahara kindly sent by M. de Geoffroy, Strasbourg, France, was most acceptable. It included several well-preserved examples of the unique coral *Calceola sandalina*, a Middle Devonian zone marker of world-wide distribution. The species is very rare in North America. Up to the present our collection contained specimens from Germany only.

By exchange the Parks Collection of Stromatoporoids, one of the finest in existence, was increased by rare specimens and microscopic sections from Professor J. J. Galloway, of Indiana University, in return for specimens sent to Dr. Galloway to aid in his research.

In addition we received from Dr. Gunnar Henningsmoen, of the Oslo Paleontologisk Museum, very interesting graptolites in half relief and hyolithids with opercula in exchange for latex moulds of our Cambrian-type trilobites from the Maritime Provinces.

Catalogued specimens numbered 259.

The following outline deals with current investigations.

The Nipissing-Mattawa collection, mentioned in the foregoing, has constituted one of our main research problems. The fossils are being studied with a view to correlating the strata from which the specimens were obtained.

Another major project, which will probably be completed within the

present calendar year, involves a statistical investigation of the brachiopod genus *Leiorhynchus* to determine morphological variation. Specimens from widely separated areas on the continent are being used. It is hoped that this comprehensive study will lead to a better understanding of the value of the various species as index fossils. Mr. R. R. H. Lemon is collaborating with the Curator in this research.

Identification of reef fossils from drill cores east of Hay River in the Northwest Territories provided an age determination of the rocks for Dr. J. C. Sproule, who donated the samples in return for the service.

Bryozoa from Storm Creek, Highwood Pass, Alberta, are being studied microscopically in an attempt to date the rocks for Stratigraphic Service Limited in Calgary. The specimens submitted for study have been donated and will provide useful material for future reference.

Published research includes a paper entitled "An Upper Cambrian Coral from Montana" by M. A. Fritz and B. F. Howell. Dr. Howell is Professor of Palaeontology at Princeton University. This article appeared in *The Journal of Paleontology*, vol. 29, no. 1, January, 1955.

As Professor of Palaeontology at the University of Toronto, the Curator gave two undergraduate courses—one in palaeontology, the other in stratigraphy; took part in examining committees of the Graduate School; conducted two postgraduate courses; and directed the studies of three postgraduate students.

As editor of the Geological Association of Canada, the Curator produced vol. 7, pts. I and II, of the Proceedings of that organization. She will present a paper on "Devonian Geology along the Abitibi River" at the Annual Meeting of the Geological Association of Canada to be held in Toronto early in June.

Among the institutions to which service was rendered may be noted the following: Geological Survey of Canada; Petroleum Research Company, Denver, Colorado; New Mexico Bureau of Mines, Socorro; Université de Rennes, France; Ontario Veterinary College, Guelph; Life Magazine, New York; Copp Clark Company, Toronto; University of Aberdeen, Scotland.

During the year a number of scholars visited the Museum among whom may be noted:

Professor J. J. Galloway, one of the greatest living students of Stromatopoids, and Mr. J. St. Jean, both of Indiana University, to study the world renowned Parks Collection.

Dr. R. D. Hutchinson of the Geological Survey of Canada, Canadian

authority on the Cambrian, to study the Matthew Collection of type trilobites from Newfoundland.

Professor E. J. Buehler, University of Buffalo, recent monographer of the coral family *Halysitidae*, to examine our collection.

Professor David Baird, State Geologist and head of Department at Memorial State College, St. John's, Newfoundland, to observe our cataloguing system with a view to setting up his new university department.

Special exhibits on display during the year were as follows: Nautilus shells, fossil and recent; the Ginkgo, fossil and recent leaves; Prawn, fossil and modern; Trilobite and other Fossil Shells in black shale that lived in an ocean nearly half a billion years ago.

DIVISION OF ENTOMOLOGY

By G. B. WIGGINS

During the year all members of the Division have had in preparation studies of monographic scope.

The Curator continued with the preparation of "The Orthoptera of Eastern Canada," and that portion of the manuscript dealing with the families *Rhaphidophoridae* and *Gryllidae* was completed. Encouraging progress has been made in the investigation of the movements of the Monarch Butterfly in North America, and the manuscript of a report presenting the results of the past three years' work is now ready for publication. Descriptions of the orders of aquatic insects were completed for a forthcoming popular book on these groups.

Dr. Walker, Honorary Curator of the Division, continued with his monograph of the Odonata of Canada and Alaska, the first volume of which was published last year. With work on the Anisoptera under way, the manuscript for the families *Gomphidae*, *Petaluridae*, and *Cordulegastridae* was almost completed, while that for the *Aeshnidae* was well advanced. Special attention was given to the subdivision of the genus *Gomphus* and the results, offering an apparently sound basis for the classification of the North American species of this genus, are being prepared for publication in a separate paper. Dr. Walker also brought together his more than fifty years of continual observation on the distribution of a number of insect species in several localities of southern Ontario and examined them in the light of meteorological records. The conclusions were presented as an invitation paper, "Changes in the Insect Fauna of Southern Ontario Associated with Climatic Change," at the annual meeting of the Entomological Society of Canada held in Sault Ste. Marie, Ontario.

The major project in the Assistant Curator's work on Trichoptera was a phylogenetic and zoogeographic study of the *Phryganeidae* of the world. All available data concerning the North American species are being gathered during the course of this study with the intention that these will also provide the basis for a monograph of the phryganeid caddisflies of North America. Facilities for rearing larvae have been greatly increased with particular attention being given to the association of larvae and adults for North

American species of phryganeid caddisflies. A collecting expedition of one month's duration was made into southwestern and southeastern Ontario, resulting in the addition to the research collection of 2,500 specimens of Trichoptera, representing 15 families. The study of the caddisfly genus *Beraea* in North America was completed and the results published as Contribution no. 39 of this Museum.

Material added to the research collection included several important accessions. A collection of over 1,000 specimens of Odonata representing over 80 species from the southwestern United States was purchased. Collections from southern Ontario by the staff of the Division accounted for an additional 100 specimens of Odonata. A. G. Edmund, of the Museum staff, donated 75 specimens of Odonata from Ontario.

Collections of Trichoptera added during the past year included the staff collection, previously mentioned, of 2,500 specimens from Ontario. Valuable donations of Trichoptera included 700 specimens from Alberta, 200 specimens from Manitoba, and 75 specimens from Newfoundland. The Division acknowledges with appreciation these contributions from Ferris Neave, of the Pacific Biological Station, R. K. Stewart-Hay, of the University of Manitoba, and A. M. Fleming, of the Newfoundland Fisheries Research Station. An additional 125 specimens of Trichoptera from Europe were obtained through exchange.

Portions of the research collection were utilized in the research of systematists in other institutions. These loans were made to the University of Kansas, Cornell University, the Academy of Natural Sciences of Philadelphia, and the National Museum of Canada.

The Division acknowledges the cooperation of a number of institutions and individuals in lending specimens from their collections. While appreciation is extended to all, a few may be mentioned: G. P. Holland and E. G. Munroe, Canadian Department of Agriculture; H. H. Ross, Illinois Natural History Survey; D. G. Denning, California; M. E. Smith, University of Massachusetts; D. C. Ferguson, Nova Scotia Museum of Science; G. H. Beatty, Pennsylvania. Very significant assistance in the preparation of a reference file for Trichoptera and in other respects has been rendered by F. C. J. Fischer, Rotterdam, Holland.

The Curator presented the systematic entomology portion of the undergraduate course (Zoology 25), University of Toronto, and served on advisory and examining committees for several graduate students. Under his direction W. Y. Watson prepared and submitted a doctoral thesis, "A Study of the Phylogeny of the Genera of the Tribe Coccinellini (Coleoptera)." The Curator attended the annual meeting of the Society of Systematic

Zoology in Berkeley, California, as a member of the Council of that society. Twenty-six lectures to various organizations on the work of the Museum were delivered during the past year.

The Honorary Curator, Dr. Walker, contributed a review of the recent book, *A Manual of the Dragonflies of North America (Anisoptera) Including the Greater Antilles and the Provinces of the Mexican Border*, to the *Canadian Entomologist*.

A very valuable addition to working facilities was made this year with the installation of equipment for rearing aquatic insects from immature to adult stages. Although constructed for rearing Trichoptera, this equipment is adaptable to any group of aquatic insects and a full range of aquatic habitats can be simulated. Designed and constructed by members of the Museum staff, the apparatus provides space for rearing 90 specimens simultaneously in individual compartments.

As in past years, members of the Division identified insects and other invertebrates for government departments, industries, and private persons.

A great deal of progress was made in the reorganization of the non-hexapod invertebrate collection, with the work being done largely by a graduate student in the University. Almost all of the identified material from the Huntsman Collection has now been transferred to more permanent storage containers and arranged systematically. Complete index lists of the isopods and amphipods in the collection were prepared. Several lots of unsorted material, chiefly of the Huntsman Collection have been turned over to the National Museum of Canada where identifications may be made and the material put to more immediate use.

DIVISION OF ART AND EXHIBITS

By T. M. SHORTT

With the completion of work on four habitat groups in mid-March, the major project of the Division for the past three years, a Gallery of Canadian Fishes, was brought to conclusion. The idea of installing a new gallery of Canadian fishes was conceived some five years ago by the Museum and the Canadian Department of Fisheries as a cooperative project. It was formally opened on March 28th by the Honourable James Sinclair, P.C., M.P., Minister of Fisheries for Canada.

The gallery occupies some 2,000 square feet of floor space in the Zoology north wing. The displays are housed in thirty-five custom-built showcases supplied by the Department of Fisheries, and feature the Museum's collection of about 250 casts representing 152 species of Canadian fishes. Over 100 of these casts were prepared specially for the gallery since 1952 by the Division of Art and Exhibits. Exterior lighting has been eliminated and cold cathode tube lights have been installed within the cases.

The first exhibit, at the gallery entrance, answers the question, "What is a fish?" Succeeding panels show the variety of body form, colour, and external covering in fishes; the functions of fins; the reproduction of fishes; the development from egg to adult; and a gross classification of living fishes.

Following these introductory exhibits are 15 cases devoted to a descriptive series of casts of Canadian salt- and freshwater fishes. This series includes every major group of fishes known to occur in Canada with special emphasis on those of commercial, game, or biological significance.

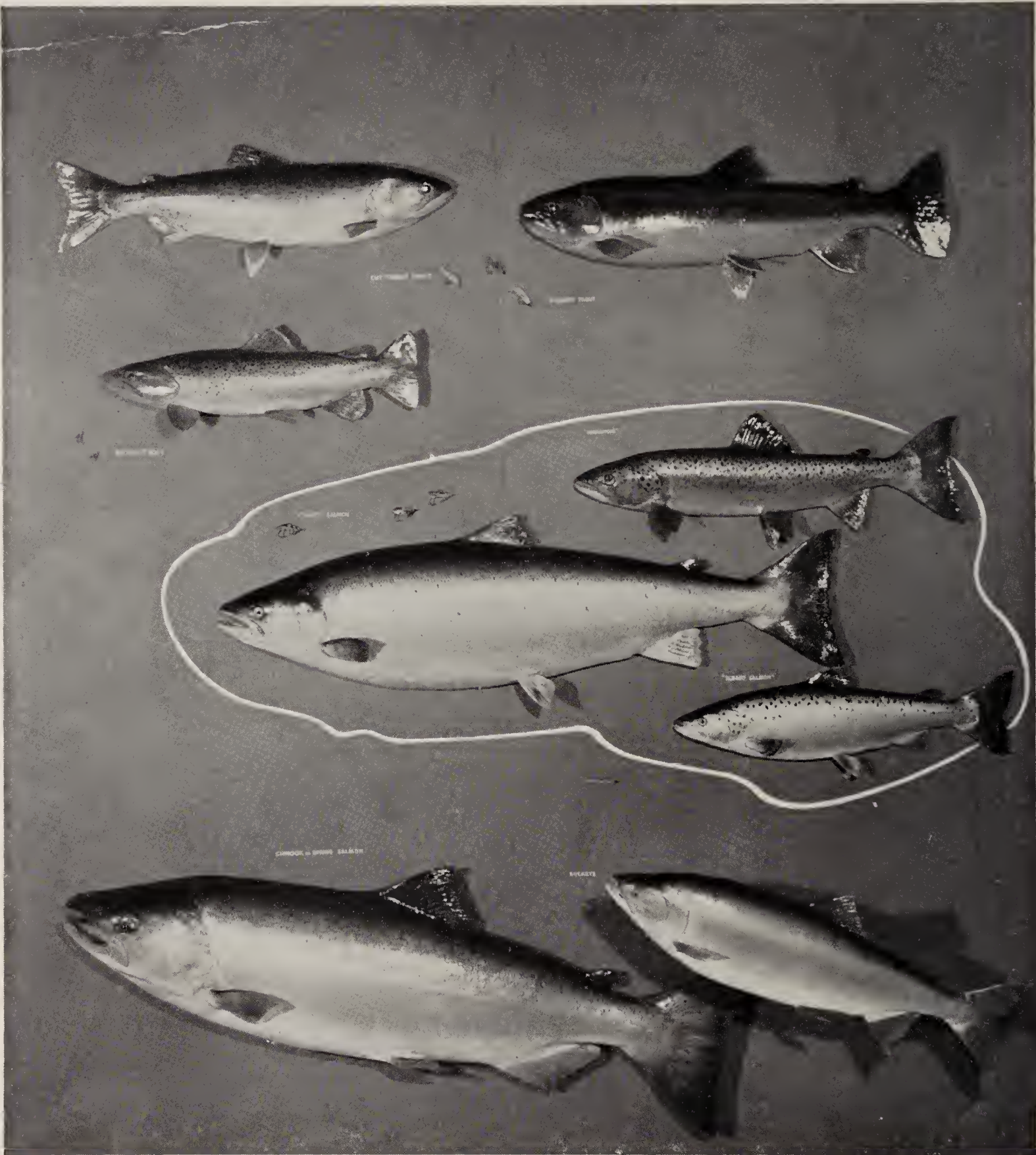
Spaced at intervals between the panels of the descriptive series are four habitat groups. The cases are 8 feet wide, 11 feet high, and 5 feet from back to front. The settings of two of these groups are marine and two freshwater. The marine groups present a scene on the ocean floor on the Grand Banks of Newfoundland with cod and haddock featured, and an open-water setting which shows an albacore attacking a school of Pacific herring. The freshwater groups depict a typical gill-net setting in cold, deep water with whitefish, lake trout, and ciscoes enmeshed in and swimming about the net, and a characteristic weedy bay of a muddy-bottomed lake with black bass,



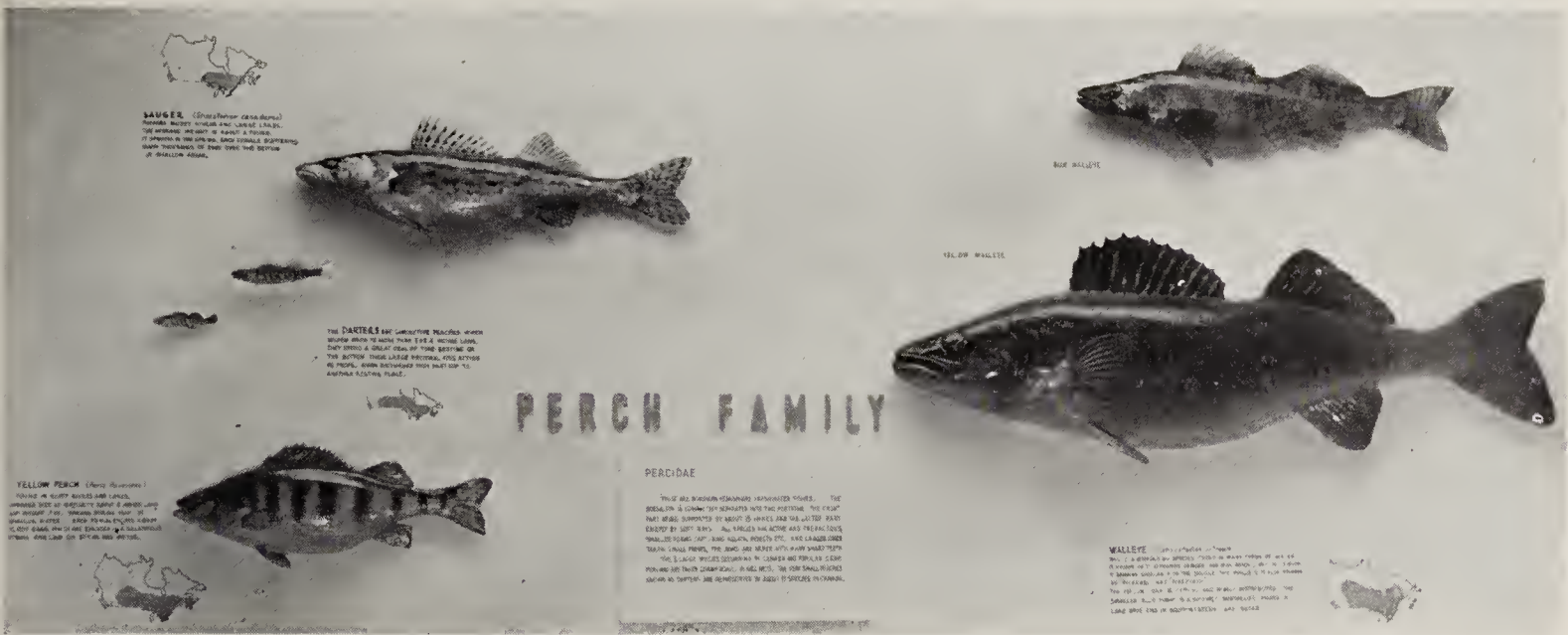
Curator of the Museum's Division of Ichthyology, Dr. W. B. Scott, discusses details of a cast with T. M. Shortt, Chief of Division of Art and Exhibits. This is one of the panels devoted to the descriptive series of Canadian Fishes

muskellunge, and associated fishes. The fishes in these groups, as well as many in the descriptive series, were made by the rubber-casting technique described elsewhere in this report.

Ten cases have been provided to display a series of scale models of Canadian fishing vessels. Diagrams accompanying these models show the several types of gear used in Canadian salt and fresh water and the methods by



A typical panel from the descriptive series, showing some members of the Salmon family



The Perch family is illustrated by means of accurate casts and maps showing its occurrence in Canada



Members of the Museum's Division of Art and Exhibits freeing a rubber cast from its plaster mould. The specimen is an Albacore which will be seen in one of the marine groups. The fine specimen from which the mould was made was secured by the Department of Fisheries and shipped from the west coast to the Museum in a frozen condition



Museum artist Archie Reid trims excess rubber from the cast of the Albacore, which will be painted and form the focal point of the Tuna group

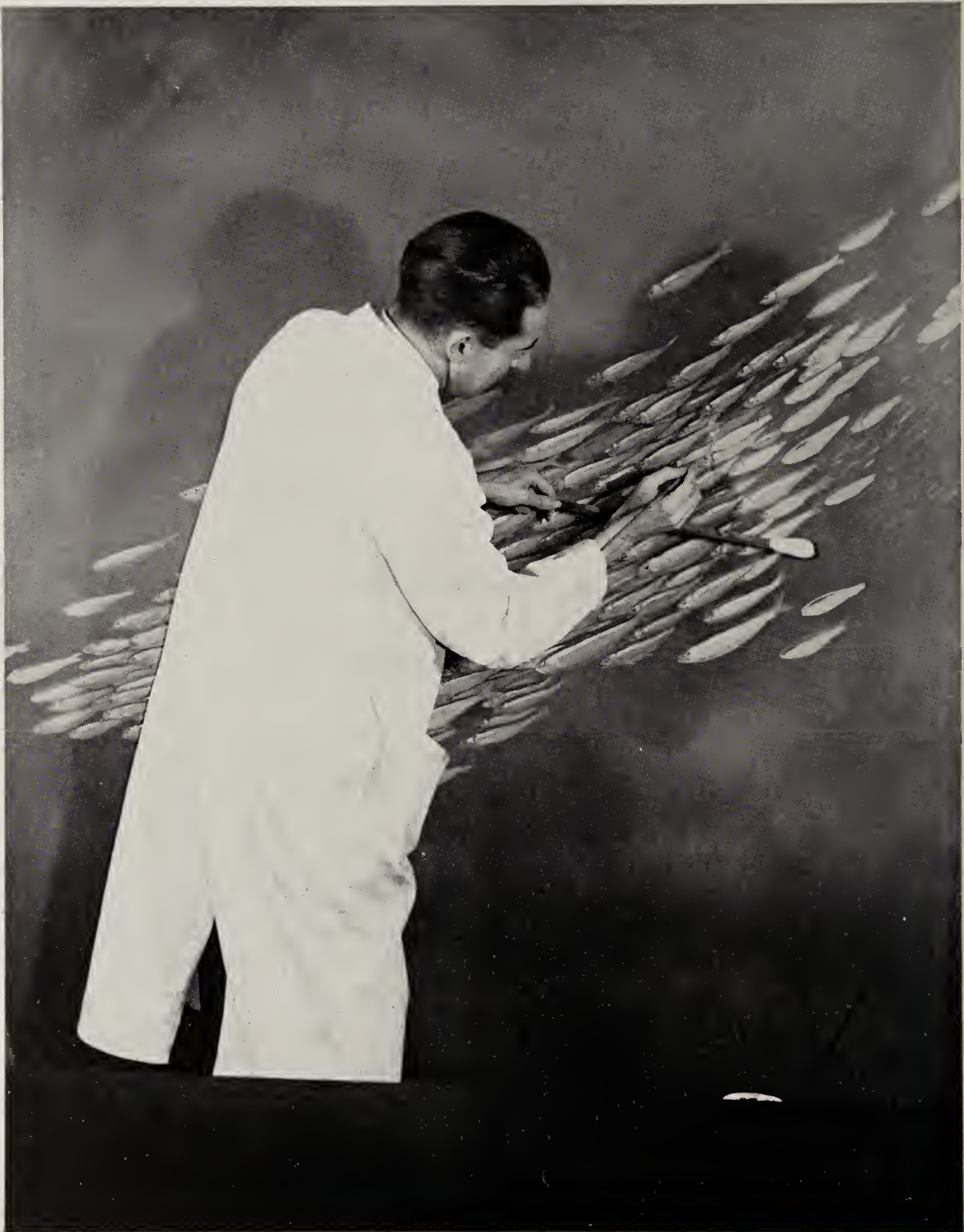


Archie Reid shows the completed two-piece mould of a Rainbow Trout

which they are operated. The vessels displayed include trawlers, purse-seiner, trollers, and long-liners.

Two sets of decorative murals present in diagrammatic style the fishing methods of the aboriginal peoples of Canada and the birth and growth of the Canadian fishing industry.

To provide space for topics of seasonal or current interest two temporary exhibit shadow boxes and an automatic slide projector have been included.



A school of Pacific Herring is painted on the background of one of the marine groups by T. M. Shortt



Archie Reid places a rubber cast of an Albacore in position in one of the marine groups

For the official opening a series of slides dealing with current investigations on the control of the sea lamprey in the Great Lakes was used in the slide projector. Additional series of slides are being prepared to show various phases of the Canadian fishing industry and life stories of Canadian fishes.

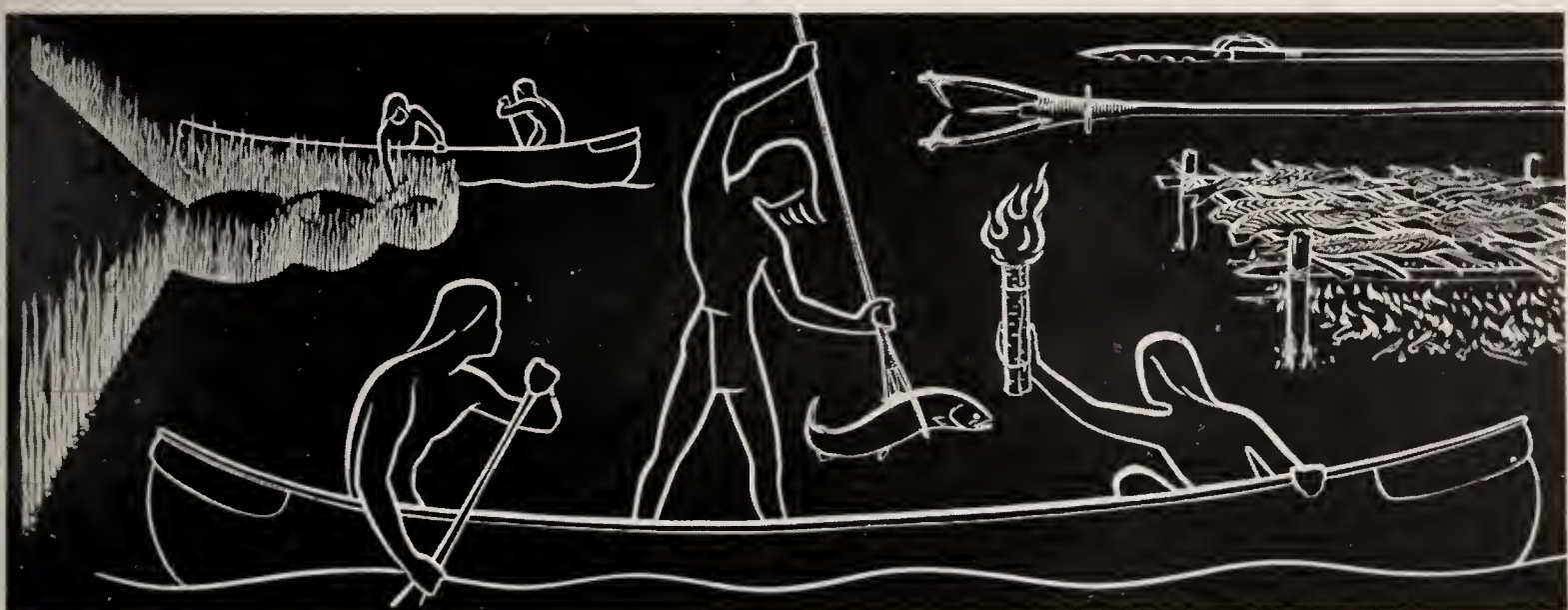
A notable accession received by the Division was an 11-foot Anaconda donated by Mr. Frank Darroch. A plaster mould has been prepared of this huge snake, and a cast for gallery display will be made during the coming year.



Herring-Albacore marine group



Museum artist Eric Thorn paints in shadows on a Cod in the groundfish group. The fishes in the groups are coloured to represent their appearance under water, not as they appear when caught and removed from the water



One of the three panels of the decorative mural which illustrates the fishing methods of Canadian aborigines

ZOOLOGICAL LIBRARY

By E. R. McCLURE

During the year 1,788 publications were received and catalogued, bringing the total holdings of the library to 62,573.

	By exchange and donation	By purchase	Totals
Bound books	28	56	84
Unbound periodicals	1,009	178	1,187
Separates and reports	483	34	517
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Totals	1,520	268	1,788

The compilation of lists of duplicates in the library was begun this year, and six lists have been made up. These were sent to several Canadian libraries, and as a result we have been able to supply them with publications which they lacked.

Several new exchanges were arranged this year, among which three were with European institutions and one with a South American institution. The library received donations from Miss H. E. Fernald, Toronto, Ontario, and from Mr. R. B. Kloss, Lansdowne, Ontario. Two new periodicals now received on subscription are *Mammalia* and *Saugetierkundliche Mitteilungen*, and *Natur og Museum* is now received on exchange from the Naturhistorisk Museum, Denmark.

Inter-library loans increased this year. Several loans were made to other libraries and forty-six received. In this connection special mention should be made of the cooperation extended to us by the library of the Museum of Comparative Zoology, Harvard University, and also of the help in locating publications which we received from the Reference Services, National Library, Ottawa.

It was decided this year to discontinue all of the Museum publications except the Annual Report, Contribution Series, and books, and to substitute for all other series one miscellaneous group. The following series are, therefore, discontinued (the last number of each is shown in parentheses): Mis-

cellaneous Publications (3), Occasional Papers (10), Handbook (6), Pamphlet Series (1), Leaflet (10), Bulletins (9).

In future the publications of the Royal Ontario Museum of Zoology and Palaeontology will consist of:

Contribution Series (a continuation of the present Contribution Series)

Annual Reports

Books

A fourth class of publication will consist of miscellaneous, un-numbered articles.

PALAEONTOLOGICAL LIBRARY

By E. N. HAMMELL

Seven hundred and ninety-eight publications were received during the year 1954-55. The number of books, separates, and periodicals catalogued was 860, bringing our library total to 22,733.

	By exchange and donation	By purchase	Totals
Bound books	5	4	9
Unbound periodicals	254	21	275
Separates and reports	502	12	514
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Totals	761	37	798

Many contributions in palaeontology and stratigraphy have been received, on an exchange basis, from organizations throughout the world. We are most grateful for these valuable additions to our library.

Inter-library loans were made with the Geological Survey of Canada, the Imperial Oil Company, Alberta, and Princeton University.

The sales of the Museum publications have shown an increase during the year.

STAFF PUBLICATIONS

- BAILLIE, J. L. Bush birds (Bush News, vol. 4, no. 1, Dec., 1954, p. 6).
- Christmas bird census—1953—Toronto, Ont. (Canadian Field-Naturalist, vol. 68, no. 1, Jan.—Mar., 1954, pp. 22–23).
- The Christmas bird count, 1953 (Bulletin, Federation of Ontario Naturalists, no. 64, spring, 1954, pp. 32–37).
- Clifford Ernest Hope (Auk, vol. 68, no. 1, July, 1954, p. 348).
- Clifford Ernest Hope (1910–1953) (Royal Ontario Museum of Zoology and Palaeontology, Report of the Director for the year ended June, 1954, pp. 5–10).
- Fall migration, Ontario—western New York region (Audubon Field Notes, vol. 9, no. 1, Feb., 1955, pp. 22–24).
- Fifty-fourth Christmas bird count, Toronto (Audubon Field Notes, vol. 8, no. 2, Apr., 1955, p. 55).
- Kinglets, vireos, shrikes, waxwings, pipits and starlings (Canadian Nature, vol. 16, no. 4, Sept.—Oct., 1954, p. 120).
- Nesting season, Ontario—western New York region (Audubon Field Notes, vol. 8, no. 5, Oct., 1954, pp. 342–344).
- Shore birds (Canadian Nature, vol. 16, no. 3, May–June, 1954, p. 104).
- Spring birding highlights along Lake Erie (Bulletin, Federation of Ontario Naturalists, no. 67, winter, 1955, pp. 34 and 38).
- Spring season, Ontario—western New York region (Audubon Field Notes, vol. 8, no. 4, Aug., 1954, pp. 309–311).
- Winter season, Ontario—western New York region (Audubon Field Notes, vol. 8, no. 3, June, 1954, pp. 248–250).
- Review: Last of the curlews (Toronto Anglers and Hunters Association News Bulletin, Apr., 1955, p. 4).
- FRITZ, M. A. and B. F. HOWELL. An Upper Cambrian coral from Montana (Journal of Palaeontology, vol. 29, no. 1, Jan., 1955, pp. 181–183).
- PETERSON, R. L. North American moose (Toronto: University of Toronto Press—Royal Ontario Museum of Zoology and Palaeontology, 1955. Pp. 280).
- Review: Die Wildkatzen der Alten Welt. Eine Übersicht über die Unter-gattung Felis (Journal of Mammalogy, vol. 35, no. 2, May, 1954, pp. 271–272).
- SCOTT, W. B. Occurrence of the ninespine stickleback, *Pungitius pungitius*, in Newfoundland, Canada (Copeia, 1955, no. 1, Feb., p. 56).
- Review: The western end of Lake Erie and its ecology (Copeia, 1954, no. 3, July, pp. 241–242).
- [Lawler, G. H., and W. B. Scott]. Notes on the geographic distribution

- and the hosts of the cestode genus *Triaenophorus* in North America (Journal Fisheries Research Board of Canada, vol. 11, no. 6, Nov., 1954, pp. 884–893).
- SNYDER, L. L. Another hybrid *Junco hyemalis* x *Zonotrichia albicollis* (Auk, vol. 71, no. 4, Oct., 1954, p. 471).
- Review: Last of the curlews (Bulletin, Federation of Ontario Naturalists, no. 68, spring, 1955, pp. 39–41).
- STERNBERG, L. When dinosaurs ruled the land (Canadian Nature, vol. 17, no. 1, Jan.–Feb., 1955, pp. 12–20).
- WIGGINS, G. B. The caddisfly genus *Beraea* in North America (Trichoptera) (Contribution Royal Ontario Museum of Zoology and Palaeontology, no. 39, Nov., 1954. Pp. 13).

